An Assessment of Group Attitudes Toward the Visual Attractiveness of Varying Silverculture Prescriptions

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AN ASSESSMENT OF GROUP ATTITUDES TOWARD THE VISUAL ATTRACTIVENESS OF VARYING SILVICULTURAL PRESCRIPTIONS

TECHNICAL COMPLETION REPORT

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CHAPTER 1

INTRODUCTION

In recent years, increased attention has been given to managing the visual resources of national forest lands in a more comprehensive and systematic manner than past efforts. Public expectations are shifting from expectations of quantity, to expectations of quality in forest resources, challenging land managers to maintain an esthetically acceptable environment. As a result, landscape planning is now receiving national and international recognition, as evidenced by a recent conference held in Nevada on the Management of the Visual Resource (Elsner and Smarden 1979).

The multiple use principle governing the use of the National Forest lands requires consideration to be given to all forest resources when formulating land use policies. Scenic beauty and timber production are two important forest resources which frequently come into conflict. However, the U.S. Forest Service is directed through a variety of legistlation and policy to manage timber removal and other resources in a manner that maintains the visual qualities of the landscape. Such direction is contained in a variety of federal legislation and agency policy.

The Multiple-Use Sustained Yield Act of 1960 requires that the "relative values of the various resources in particular areas" be given proper consideration in deciding how the national forests are to be managed. The National Environmental Policy Act (NEPA) of 1969 directs Federal agencies to:

> ...improve and coordinate Federal plans, functions, programs and resources to the end that the nation may assure for all Americans safe, healthful, productive and esthetically and culturally pleasing surroundings (Sec. 101). ...identify and develop methods and procedures which will insure the presently unquantified environmental amenities and values may be given appropriate consideration in decision making along with economic and technical considerations;..." (Nat. Env. Policy Act of 1969 [42 USC 4321, Sec. 102]).

In 1976, Congress went a step further by emphasizing the visual resource throughout the National Forest Management Act (NFMA). It further directed the Forest Service to allow timber harvests only where:

> ...the potential environmental, biological, esthetic, engineering and economic impacts on each advertised sale area have been assessed,...cut blocks, patches, or strips are shaped and blended to the extent practicable with the natural terrain;...such cuts are carried out in a manner consistent with the protection of...esthetic resources...(NFMA of 1976, Sec. 6, amendment to Forest and Rangeland Renewable Resources Planning Act of 1974).

The Federal Land Policy and Management Act also requires the federal land managing agencies to:

> ...prepare and maintain on a continuing basis an inventory of all public lands and their resources and other values, (including, but not limited to outdoor recreation and scenic values),...(FLPMA P.L. 94-579; a43 USC, 1976.

Protection of the visual resource requires an understanding of (1) how the public responds to potential visual instrusions into natural appearing landscapes, and (2) the development of assessment methodologies to describe visual impacts and measure the public's response. To accomplish protection and management of the visual resource, the Forest Service has developed the "Visual Management System" (USDA 1974). The objective of the Visual Management System (VMS) is to "...manage all National Forest System lands so as to attain the highest possible visual quality commensurate with other appropriate public uses, costs, and benefits." (Forest Service Manual, 2380.2). The system classifies landscapes into "variety classes," estimates their level of sensitivity to public reaction and after comparing the two,

identifies "Visual Quality Objectives" (VQO's), which guide timber harvesting, road construction, siting of facilities e.g. (powerlines), and other forest management activities. The VQO's that may result from the system are (1) Preservation, (2) Retention, (3) Partial Retention, (4) Modification and (5) Maximum Modification. Excluding the Preservation Objective, each describes a different degree of retention or acceptable alteration of the natural appearing landscape (Bacon 1979).

Unfortunately, the relationships or linkages between VMS objectives and actual benefits as perceived by the general public have never been systematically established. Simply put, a given project may or may not attain the level of visual benefits or quality for the public that was intended. Public land managers and researchers are aware of the need to establish this linkage as an essential tool to be used in evaluating the effectiveness and/or appropriateness of visual management activities. This is important because in planning for a given objective, the landscape architect is in a de facto sense expressing public preferences for visual quality. A feedback mechanism needs to be found through which visual benefits provided to public viewers can be related to the visual objectives planned. The basic question that needs to be addressed is whether a given VQO planned for in a given project is accomplished after the project has resulted in an appropriate level of visual quality.

The Bureau of Land Management (BLM), an agency within the Dept. of Interior that oversees about 60 percent of our Nation's federally-owned lands has also developed what they term the Visual Resource Management (VRM) system (Ross 1979). The system is very similar to the one used by the Forest Service in that it involves an inventory of the visual resources and identification of relative scenic value ratings for all lands. Visual sensitivity is determined by including public groups and their attitudes

along with use volume in the VRM program. These factors, along with distance zones from major viewpoints are all combined, yielding a map that identifies areas with similar combinations of factors. The areas are assigned into 5 VRM classes where Class 1 represents primarily natural areas such as wilderness, through Class 5 representing severely altered landscapes.

The map of the VRM classes is used in the BLM's multiple use planning process and becomes the basis for developing visual resource management objectives (Ross 1979). It is also used to assess the visual impact of proposed development activities, although like the Forest Service's system, lacks a clear linkage between the objectives of a project and actual benefits as perceived by the public. The BLM also has no developed means to determine whether the planned visual objective in a given project was in fact accomplished after completion.

STATEMENT OF PROBLEM

The problem of evaluating a scene lies in the inherent subjectivity of measuring people's perceptions of its esthetic value. As Patey and Evans (1979) discuss, a major problem facing visual resource managers is identifying the types of forest landscapes which the public prefers. Objectively acquiring knowledge of the public's preferences, as already mentioned, is an important process in visual resource planning. But, how are people's esthetic preferences measured in an objective, quantifiable manner?

The questions that arise when one considers methods are troublesome, and yet need to be addressed if reliability and consistency are to be achieved. Schweitzer, Ullrich and Benson (1976) list 3 questions they feel need to be answered in developing methodologies for visual assessment, the results of

which can be consistently used in complex decisions involving timber harvesting practices:

> (1) Do individuals and groups with differing backgrounds differ widely in their perceptions of, and judgements about, the visual appeal of harvested areas? If so, how do they differ? (2) Do judgements of visual appeal depend upon the physical perspective or vantage point of the viewer? (3) Can judgements of case study areas be usefully quantified, are they reliable, and can they be generalized for application elsewhere?

Swanson (1976) follows with the suggestion that the method chosen "should be free from confounding effects such as would occur if extraneous elements of a forest scene such as roads or other harvested units, influenced peoples preferences more than the unit being considered." The following chapter contains an overview of the varying kinds of visual resource assessment methodologies and measurement techniques available. Survey findings of public preferences that have used several of these methodologies will also be discussed.

CHAPTER 2

METHODOLOGIES AND MEASUREMENT TECHNIQUES

Since attention has been drawn to the visual element of our national forests, many measurement techniques to evaluate forested landscapes have been developed. Each method has its part to play in evaluating the esthetics of different silvicultural treatments. The general categories of approaches include:

1. descriptive assessments,
2. evaluative assessments,
3. preferential assessments.

Descriptive Assessments

Descriptive assessments involve a sort of esthetic mensuration where landscapes are described in a systematic manner through the use of certan concepts and rules. These approaches emphasize qualitative descriptions over quantitative assessment.

The most successful descriptive inventory methods have been developed by landscape architects. In particular, Litton (1968) developed a method that emphasized the identification and evaluation of land forms in terms such as form, line, texture, contrast, color, etc. These land form characteristics are then integrated with various observer positions. This allows for different "compositional units" to be identified. Descriptive assessments can be used to examine large areas of land, or simply concentrate on

describing in detail, small individual landscapes. They result in nominal level classifications, but infer no ordering of visual quality. The main disadvantage of this approach lies in its inability to relate the features in the inventory to validated measures of preferred forest landscapes. It also cannot predict the result of man-caused alterations of a forest scene. Landscape descriptions can serve as a benchmark for comparison with later inventories, however, description alone does not offer guidance in planning silvicultural projects.

Evaluative Assessments

This assessment method uses descriptions of landscape "quality" that are presented in oral, or written form to selected respondents. Responses from both closed and open ended questions are usually analyzed to yield summary indications of opinions and preferences of respondent groups (Daniel and Boster 1976). Subsequently, group preferences may be related to landscape beauty. Phrasing for questions to be used in survey instruments is all important, and represents one of the inherent hazards of this procedure. Surveys and questionnaires can be useful for determining public preferences of forest scenes, but due to the many shortcomings of this method, researchers and planners use it infrequently.

Preferential Assessments

Like the evaluative method, the preference approach also evaluates landscape quality through the judgements of human observers. The main difference lies in the fact that this approach makes extensive use of photographs, slides, or other graphic representations of scenes. This allows

the landscape to be represented in a more direct manner than the verbal or written survey approach. As mentioned in the problem statement, obtaining objective data of the public's preferences of forest scenes is becoming more important. The use of photographic representations has been found to be a rapid way of obtaining the large number of responses necessary, while emphasizing the features being measured, as well as achieving some degree of uniformity of presentation. The obvious question that arises when photographs are used is "Will viewer ratings differ between the slides and actual on-site views of forest scenes?"

Studies done in Arizona ponderosa pine forests have shown that the proper use of color slides or photographs can in fact come very close to representing the actual landscape (Daniel and Boster 1976). The recent trend in research has been toward improving the use of the various preference assessment methods as they have shown recently to be a most convenient means of determining, in a quantified manner, peoples' preferences toward timber harvesting techniques and consequences.

MEETING VISUAL QUALITY OBJECTIVES: NONPREFERENCE TECHNIQUES

The nature of the harvest prescription has an important influence on esthetics. When preference information is not available for use during a visual resource inventory, which is almost always the case, planners must use what tools are available in evaluating whether project impacts will meet established visual objectives.

In the absence of preference information, land managers most often use the agency visual management system and identify landscape physical factors that affect the ability of that landscape to "absorb" certain harvest

prescriptions. Litton's descriptive approach of using certain characteristics of the land may be used to predict the landscape's vulnerability to impact from roads or timber harvest. In this system, land planners must not only recognize landscape compositional types, but also be aware of sensitive parts and locations such as edges where dissimilar materials come together. Litton (1974) argues "examples would be sky meeting land or forest, water meeting beach or riparian strip, ridgeline meeting distant surface, mineral face meeting brushland, or conifers meeting hardwoods. The visual relationship of one to the other runs the gamut in contrast - from high to low. The more conspicuous a meeting of ingredients, the more vulnerable it is to the impacts of change." Also to be considered are the outside influences and inherent effects such as orientation, climate, seasons, slope, and soil and vegetation surfaces.

By combining the characteristics described above, a determination of the fbility of a landscape to absorb man's logging activities can be made. This is known as the "Visual Absorption Capability" or VAC of the landscape. If a high VAC is determined, the ability of the landscape to absorb a certain activity is fairly great. A low VAC means a greater difficulty will be realized in achieving the visual quality objectives.

In the North Cascades of Washington, Henley and Hunsaker (1978) describe how through a combination of the established Forest Service visual quality objectives (VQO's) and the VAC of the area, visual quality can be retained. Their approach starts with obtaining a VAC map, and via the major travel routes and use areas, a "seen area" and "not seen area" map is produced. By combining these two maps, a seen area/VAC matrix results which recognizes sensitive and nonsensitive areas, and determines areas where the VQO's can

most easily be achieved. With this accomplished, they are able to plan for Foad location and appropriate timber harvest prescriptions. As summarized by the authors: "Using this VAC and seen area data, the landscape architect, forester/silviculturist, logging system engineer and civil engineer can work as an interdisciplinary team to match visual objectives, silvicultural objectives, logging systems and the land VAC to determine location, size, method, and scheduling of timber harvest activity while retaining visual quality." (Henley and Hunsaker 1978). Research and other interdisciplinary planning efforts have shown that similar approaches can become very effective tools in planning timber harvests in many different forest environments (Tlusty 1979, in the Kootenai National Forest in Montana: Kell 1979, in the Allegeny National Forest in Pennsylvania; and Twito 1978).

SURVEY FINDINGS OF PUBLIC PREFERENCE

There has been a considerable amount of research in recent years in collecting and evaluating peoples preferences for forest scenes. What has generally been found is that it is not the removal of timber, but the manner in which it is removed that either increases or decreases esthetic appeal in near ground or close up views. In an early study done in the Adirondacks, Rutherford (1969) found that most people preferred a hardwood or conifer stand that had been selectively cut ten years prior, above a similar virgin stand. Even when as much as eighty percent of the volume was removed, the decision of 160 randomly selected adults was still in favor of the cut stand. Overall results in this study seemed to favor selection management systems over an undisturbed forest. The author also points out that other operations

such as shelterwood, seed-tree, and even proper clearcut techniques could also have the potential for increasing the esthetic value of a managed stand.

Similar results were attained by Patey and Evans (1979) who used a dual assessment approach that combined both qualitative evaluation of the public's preferences and quantitative assessment of the physical components of the landscape. Color slides were used to obtain ratings of certain areas on the basis of their perceived esthetic quality. An analysis of preference ratings indicated a significant preference for manipulated landscapes. On the basis of scenic beauty, landscapes with less dense woody shrub cover and a higher percent of herbaceous ground cover, such as forbs and grasses, were preferred. In short, what their results showed is that the visually preferred forest landscape is open and parklike in appearance.

In a 1973 study of surburban forest owners (Hamilton, Rader and Smith) photographs were used to measure the degree of preference different owners had toward various logging practices. They found there were generally three broad groupings of practices that elicited "pleasant responses"; esthetic beauty, neat industrious activity, and easy access. Neat uniform rows of pruned conifers received the highest overall "pleasant" rating of any single feature as the chart of their findings in Table 1 shows. Pictures displaying

TABLE 1

Responses, as percentage of grand total for photos showing various forest practices.

FOREST PRACTICE	unpleasant	pleasant	neutral
Slash	75%	7%	18%
Stumps	45%	10%	45%
Green ground cover	12%	70%	18%
Deciduous reproduction	18%	62%	20%
Pruned boles	6%	91%	3%
Unpruned boles	66%	6%	28%
Stand Uniformity	8%	72%	20%
Variation in tree size (diversity)	10%	54%	36%
Canopy opened by cutting	7%	76%	17%
Roads (not new raw ones)	7%	80%	13%
Row thinning of trees	3%	80%	17%
Invading deciduous species	63%	17%	20%
Damage to residuals	84%	4%	12%

Source: Hamilton et al., 1973.

men at work with chain saws or piles of wood products even elicited a pleasant response, as long as careful use of tools and active pursuit of a definite end were evident. Roads were considered pleasant as long as they maintained a blended appearance with the local environment. On the other hand, unsanitary logging that left trees hanging and excessive slash that had not been neatly piled produced "unpleasant" responses for the most part.

There is general agreement in the literature that excessive slash, downed wood and logging residues detract from senic quality. "The presence of snags, unmerchantable timber, small whips, and untreated logging roads can extend the [esthetic] recovery period for several decades" (McGee 1970). In Wyoming lodgepole pine, Benson (1974) found the removal of logging residues reduces by 50% the esthetic loss imposed by the logging operation. Schroeder and Daniel (1981) found that for southwestern ponderosa pine forests, the amount of downed wood on the site is a strong negative linear correlate of measures of public perception. This evidence supported earlier work by Daniel and Boster (1976) where they found a correlation of -.87 between the amount of downed wood in a forest scene and scenic quality judgements rendered by the public. In other empirical tests done in ponderosa pine forests, Arthur (1977) found that the negative scenic impact of downed wood accounted for more variance in peoples' scenic evaluations than any other single feature of the forest.

With the evidence this literature presents, it should be evident that a management policy directed toward the removal of downed wood after logging operations could greatly enhance the aesthetic quality of most areas. There are several treatments for the removal of logging residues that timber harvesters have the option of using, usually depending on the physical and economic characteristics of the particular situation. This next section will

delve briefly into the various methods used to treat logging residues, and their impacts on esthetic appeal.

ESTHETIC IMPACTS OF LOGGING RESIDUES

In Benson's 1974 study on lodgepole pine logging residues, one of his prime objectives was to compare the logging and residue treatments in terms of esthetics. Two types of esthetic evaluations were made. One dealt with using Forest Service landscape managers to appraise areas with a numerical rating. The second evaluation was made by university students who viewed slides taken at random in each of the areas and rated them on a scale from 0 (strong dislike), to 9 (strong like). The rating of treatments compared an uncut old growth stand, conventional (pile and burn) cleanup, near complete (residue removed), and chips spread over the ground. The evaluation was based on the viewpoint of an observer driving or hiking by the areas. The results are summarized below.

The uncut old growth stand was rated the highest at the year of harvest, but was expected to decine over time as tree mortality and blowdown brought a more disorderly appearance to the unit.

In the near complete (residue removed) treatment, units were rated fairly high after harvest and assuming normal regeneration, were expected to reach a high level in twenty years. Several features were noted when comparing conventional pile and burn treatments with near complete residue removal. Soil disturbance on near-complete units was not excessive, but on piled areas created visual discord. Stumps on the conventionally logged unit created more discord than low stumps on the near-complete units where the feller-buncher was able to shear timber near groundline. A good amount of herbaceous cover was also retained on the near-complete units, which helped to keep the color tone compatible with the surrounding area.

Conventional cleanup (pile and burn) was the third treatment tested. It was rated the lowest the year of harvest. A projected show of recovery was predicted, but one that would remain below the esthetic values of the near complete residue removal area.

Units which were chipped and spread were rated almost as high as the near complete removal units, however they were predicted to remain constant in their esthetic values over a 10-20 year period. This was due to the chips having a significant negative effect on the regrowth of grasses, forbs, shrubs, and tree seedlings (Benson 1982).

After the esthetic evaluations of both the landscape managers and the students were compared, a fairly high degree of similarity was found. This is en encouraging note, however, the author admits that esthetic measurements like the ones he was able to attain, cannot always be precise.

Prescribed Burning

Since economic factors enter into every logging operation, the cost effectiveness of residue removal methods must always be considered. The residue treatments outlined above that elicited high esthetic preference ratings, are also ones that tend to reduce the net dollars per acre return (Benson 1974). Prescribed burning is often an alternative management tool used to reduce logging residues that usually does not result in highly reduced net dollars per acre.

To assess the esthetic impacts of prescribed burning, Anderson, Levi, Daniel, and Dietrich (1982) compared two ten-acre ponderosa pine plots, both selectively logged, but one with a prescribed burn to remove slash. Color slides shown to panels of university students were again used to attain ratings. They found that immediately after burning, scenic values were

substantially lower than those for the comparible, unburned site. After a years time however, scenic values on the burn site surpassed those on the unburned plot. After four years time, the burn plot scenic values were essentially equal to those for the control. Hence, adverse scenic impacts, in open mature ponderosa pine stands, as a result of prescribed burning appears to have only very short-term negative effects.

The indications from this study suggest burning could indeed help to mitigate some of the adverse impacts of timber harvests. The immediate effects of burning stimulate growth of grasses and forbs, which may help to rapidly cover skid trails and other scars. Burning might also provide more long-term scenic benefits in areas where a heavier amount of slash has accompanied a harvest. With all of this in mind, it might seem like prescribed burning could become a widely used management tool for reducing logging residues impacts. However, in describing the effects of fire on scenic beauty, Mobley (1974) emphasizes the precise nature of using prescribed burning to increase esthetic appeal: "In certain timber types such as the fire-climax southern pine, a low intensity prescribed fire can be used to maintain parklike stands, emphasize vegetative-type changes, and increase the number and visibility of flowering plants. Such management techniques, however, require "precise" prescription and equally precise burning.

PUBLIC PREFERENCES FOR DIFFERENT SILVICULTURAL PRESCRIPTIONS

One of the overriding questions to be considered regarding esthetics and timber harvesting is: What timber harvesting techniques are most preferred by the viewing public? Schweitzer, Ullrich and Benson (1976) attempted to answer this question by conducting several studies in Douglas-fir and western

larch forest types in northwestern Montana. Two stands each were harvested by clearcutting and shelterwood cutting techniques. Preharvest differences in the stands were given esthetic evaluations, and camera orientation and understory were also evaluated. As predicted, the shelterwood area was preferred to the clearcut area. The results also indicated that the areas with undisturbed understories were preferred to those containing bundles of small trees, and photographs looking uphill were preferred to those looking downhill (Schweitzer, Ullrich and Benson 1976).

An updated analysis was conducted five years later on the same harvested units. The ratings illustrated in Table 2 summarize the visual impacts of several timber harvesting activities (Benson and Ullrich 1981).

Echelberger (1979) used the semantic differential to evaluate viewer reactions to newly harvested northern hardwood forest stands. The method requires respondents to use a series of bipolar adjective pairs (i.e., rough-smooth or hard-soft) to judge a concept, in this case a forest scene. When semantic differential data were factor analyzed, one factor that emerged is an index of attitudes, or an evaluation of the forest scene. The overall "impression" scores that resulted from this study further strengthened Benson's findings. It was found that viewers preferred selection cutting over clearcutting, and patch clearcutting over strip clearcutting. The data also implied that top-lopped tracts were preferred over tracts that had not been top-lopped. Viewers tended to favor tracts they perceived as delicate, smooth, or gentle as opposed to tracts perceived as rugged, rough, or violent. The strenth of this study procedure lies in its ability to be transferred to most situations where an indirect measurement of logging technique assessment may be desired.

TABLE 2

Mean ratings of timber harvest by skyline logging in Douglas-fir/larch, Coram Experimental Forest, Montana.

Treatment	Viewer Panel[1] (1)	(2)
UNCUT STAND	7.59	7.02
SHELTERWOOD		
Residue burned:	2.96	*
First year	3.43	4.06
Residue removed:		
First year	3.92	*
Second year	6.07	*
Third year	6.54	5.94
Protect understory	5.46	5.74
CLEARCUT		
Residue burned:	1.29	2.7
First year	3.63	2.76
Residue removed:		
Second year	3.27	3.09
Third year	5.04	4.02
Protect understory	*	4.97
(Critical diff.)[2]	(1.08)	(.97)

[1] Panel 1, University of Montana psychology students, 1976.
Panel 2, University of Montana forestry students, 1976.

[2] Differences between means that exceed this are significant at the 0.95 level.

* This panel did not evauate the scene.

Source: Benson, 1981.

STUDY OBJECTIVES

What is generally agreed upon as a result of these and other studies which compare different silvicultural prescriptions is that as the evidence of man's activities, or the amount of downed wood and residues increases, forest areas are less liked by most of the viewing public. Although serving as an important first step, none of these studies were designed to develop a relationship between viewer group preferences and specific visual management objectives. In addition, most of these studies used a near view or "on-site" perspective. The VMS is designed for middle ground (1/4 - 3 mile) views. While the above studies give general results, none were specifically tied to the VMS.

To get at this question, the study has the following objectives: (1) Determine how public interest groups respond to various areas in relation to established visual quality management objectives. (2) Determine if differing types of user groups assess visual impact of the same area differently. (3) Determine the relationship between ratings by public groups with those of landscape architects. (4) Determine the relationship between scenic preferences of public group categories and their atitudes toward timber harvesting.

CHAPTER 3

METHODOLOGY

Research Design:

The approach used in this study quantitatively indexed the esthetic quality of various silvicultural treatments and was initially developed by Daniel and Boster (1976). It has been termed the "Scenic Beauty Estimation" (SBE) method. Their research was directed at developing and testing methods by which public preferences can be measured using color slides of different forest landscapes. Photos of different scenes are taken according to a predetermined, stratified random sampling procedure (in order to reduce any photographer biases). Judgement by observer groups are then recorded in terms of a ten-point rating scale where a "0" indicates a judgement of "very low scenic beauty," and a "9" "very high scenic beauty." The raw responses that are obtained are then transformed to Scenic Beauty Estimates (SBE's). These SBE's are standardized relative indices of perceived scenic beauty that may be directly compared because they control for differences in observers' normative standards of scenic beauty.

For example, observers, when making scenic beauty judgements of forest landscapes, may have different standards of what is scenic, depending on the nature of their past experiences with forests. Observers growing up in the California redwoods have experiences which differ from those growing up in the Arizona desert. They will undoubtedly be using markedly different judgement criteria. Simply put, "whenever observers consistently rate the same landscape differently (as when one assigns a "3" and the other an "8")

it is likely that different criteria are being applied; their "perceptions" may or may not be identical" (Daniel and Boster 1976).

Also different observers may make use of the 10 point rating scale in a different manner. Some may use the entire scale, while others may only use a portion of it. For example, many observers do not use the upper or lower parts of the 10-point scale. The SBE method avoids the above problems by providing appropriately standardized measures (SBE's) that are again unaffected by observer criterion differences, and for the most part, are not affected by the size of the rating scale used (Daniel and Boster 1976). The relationship between the observer's perceptual judgement and the landscape features represented on the slide is what forms the basis of the Scenic Beauty Prediction Model (Daniel and Shroeder 1979). The resulting SBE scores are internal measures of the participant's perception of scenic quality.

The SBE method was initially applied by Daniel and Boster on ponderosa pine forest scenes. Their first step involved representing the various landscapes by color slides. The difficulty in this step will vary according to the size and diversity of landscapes inherent in the area being photographed. In their study, the landscapes were rather large and homogenous.

The second step in the application of this method involved presenting the slides to previously selected groups of observers. Daniel and Boster picked a total of 26 public groups representing a wide range of concerns, from foresters to environmentalists. Slides were presented one at a time and each observer recorded a judgement for each slide from the 0-9 scenic beauty scale.

The final step involved evaluating the observer judgements. The important part about the SBE's is that they permit the user to select either

a "by observer" or "by slide analysis." The SBE for a given area or landscape is the average of these individual SBE's either "by slide" or "by observer" (Daniel and Boster 1976).

The work done so far using the various SBE models clearly suggests the reliability of using this approach. Because decision-makers must justify decisions that will have long-range esthetic impacts, a tool such as the SBE method can also provide answers to their questions regarding scenic beauty recovery periods. Benson (1974, 1982) has shown that the SBE method can be successfully used to record yearly changes in esthetic judgements regarding various logging techniques. The method is also helping to answer the questions about whether groups with differing backgrounds differ widely in their perceptions of the visual appeal of harvested areas. The case studies (Benson and Ullrich 1981; Daniel and Boster 1976) conducted thus far suggest there is, in fact agreement in the scenic preferences of such diverse interest groups as forest economists and environmentalists.

This study, through the use of the SBE mehod, has built upon this past research except that the mid-range viewing distance (1/4 to 3 miles) was used. Much research in the past has used color slides of near view or on-site forest scenes. Most of the timber cutting in the Northern Rockies is viewed from travel routes outside the forest, while traveling through the forest or from towns in the viewing range.

Sample Areas

The geographical area of study included national forest lands in western Montana and northern Idaho. Each area included was selected from harvests conducted during the period 1975-1980. The sale areas chosen were limited to mature conifer stands, medium or better stocked, and on moderate slopes

(25-70%). In general, these are the most common conditions in which timber is harvested, on national forest lands in the region, and provided the representative situations for this study. All areas on which timber harvesting had occurred 3-7 years prior to photography were included as the study population. All timber sales on these lands were listed by VQO. Then five areas were randomly selected for each VQO from this list. Areas representing the preservation objective (where no timber harvesting is permitted) were located adjacent to harvested areas. Each area was visited during summer 1982 and a number of slides (with different views) of each was taken. From among these slides of each area, five slides were selected. A final total of 125 slides were included for viewer rating (5 VQO's x 5 areas/VQO x 5 slides/area = 125). Photos were composed so as to exclude features that were not representative of the general harvest area; e.g. attractive waterfalls or unattractive piles of logging slash were avoided unless they appeared to be common features of the harvest area.

Once the slides were identified they were randomly sorted into a 140-slide capacity carousel slide tray. Randomization involved five blocks of 25 slides with each area having one slide in each block. The order of slides from block to block was different.

Participant Population

A basic assumption of this study is that preferences toward scenic beauty and thus attitudes towards timber harvesting are influenced through the operation of normative group processes. There is substantial literature in social psychology which supports this assumption. Public interest groups are organizations which are frequently concerned about public policy issues,

such as timber harvesting on national forest lands, and which often adopt positions about these issues. These formal positions as well as the discussion within the group which leads to the position statement serve as the reference group norms which influence member attitudes and preferences.

Thus, in this study, then the primary population is (admittedly) crudely defined as public groups which have interests in resource management issues. This population is restricted to those groups centered in the western half of Montana.

Four types of public interest groups were initially included in the study, based on a priori assumptions about their attitudes towards timber harvesting:

GROUP 1- Represented attitudes favorable toward timber harvesting and development of National Forest lands.

GROUP 2- Represented various "activity" oriented clubs and organizations (i.e. motorcycling, snowmobiling).

GROUP 3- Represented more or less neutral groups (not strongly for or against timber harvesting).

GROUP 4- Represented those groups oriented more toward environmental and esthetic preservation.

A fifth group which was added later included the USDA Forest Service landscape architects from Regions 1, 4 and 5. This group represents individuals who work with silviculturists in applying the VMS to timber harvesting activity.

As the study proceeded in fall 1982, a list of all possible groups was developed. Contact was made with the President, Executive or Program Committee of each group requesting time to present the slides. As a result, the sample consisted of a total of 18 different groups. (Table 3)

TABLE 3

	# Of Observers in each group
FORESTRY INTERESTS	
1. Society of American Foresters	45
2. Montana Loggers Association	23
3. Advanced Timber Management Class (U of MT)	15
4. Continuing Education in Fire Mangement Group	18
ENVIRONMENTAL INTERESTS	
5. Missoula Chapter, Sierra Club	14
6. Great Falls Chapter, Audubon Society	26
7. Helena Chapter, Audubon Society	24
ACTIVITY GROUPS	
8. Hamilton Chapter, Backcountry Horseman	39
9. Missoula Chapter, Backcountry Horseman	26
10. Missoula Snowgoers (Snowmobilers)	20
11. Hellgate Motorcycle Club (Missoula)	16
LANDSCAPE ARCHITECTS	
12. Forest Service L.A.'s (Reg. 5)	25
13. Forest Service L.A.'s (Reg. 4)	29
14. Forest Service L.A.'s (Reg. 1)	14
OTHER GROUPS	
15. Introductory Recreation Management Students (U of MT)	28
16. League of Women Voters (Whitefish)	16
17. Mens Eagle Cub (Missoula)	9
18. Hamilton Community Potluck Group	26

Total Sample = 416 individuals

With the slides loaded into a slide tray, they were taken to the regular group meetings, where, usually before the meeting began the members were told they were going to be viewing scenes of forest landscapes. Standardized instructions (see Appendix I) were then read to the group. Respondents were given no other information prior to judging the slides.

Slides were then presented one at a time with each observer recording a judgement on the 10 point scenic beauty scale for each slide. Slides were exposed long enough to provide viewers sufficient time to view the slide, make and record a judgement, and prepare for the next slide; in this case 5 seconds. Five seconds has been found by Daniel and Boster to be about the lower limit time exposure with 8 seconds being about the upper limit. The longer 8 second exposure we felt was uncomfortably long. The equipment used (a 500 watt extragraphic slide projector with automatic time exposure at 5, 8 and 15 seconds) gave us only one other option (the 5 second limit). For the most part, we found our respondents were able to handle the 5 second time limit with only a rare observer refusing to rate the slides due to the speed. The rooms were darkened as much as possible for quality viewing, while still allowing for enough light to read the response sheets. (See Appendix II for a copy of the response sheets). Before rating the 125 slides, each group viewed 10 similar slides to accustom them to the range of landscapes viewed and the viewing time.

After the slide judgement session, respondents were asked to fill out a questionnaire dealing with attitudes toward timber harvesting and esthetics which was printed on the back of their rating sheets. Social demographic varibles such as age, sex and occupation were also included in this section

of the study, as well as an 11 item scale developed to measure attitudes toward timber harvesting and scenic beauty. The scale was desigend to place groups on this continum for data analysis.

Data Analysis:

The raw rating scores from 18 observer groups were entered into a computer data file along with information from the timber esthetics attitude questionnaire. Scenic Beauty Estimates (SBE's) were computed using the program provided in the SBE package (previously described in Daniel and Boster 1976). The program converted the raw rating scores (0-9 scale) to normalized scores, and used the Z score to develop the "SBE" which expresses ratings of different conditions relative to a given "base" condition (see Daniel and Boster 1976 for more detail). The SBE computer program provides two alternatives available for deriving SBE's; "by slide" or "by observer". In this study we computed SBE's only "by slide".

The SBE program also compiled mean and median ratings of raw scores along with the SBE's. The general purpose behind generating the SBE's was to test for differences in ratings among the 25 areas and for differences among interest groups.

A factor analysis identified 2 scales describing statements or variables associated with the "timber esthetics attitude" questions. The highly correlating statements on scale 1 refer to general attitudes that timber harvesting activities do not detract from scenic beauty (identified as questions 3, 4, 5, 8, 10, and 11. The highly correlating statements on scale 2 referred to statements that logging activity does detract from scenic beauty (identified as questions 5, 7, and 9. Reliability for the two scales showed a Cronbachs alpha of .68 for both scales. Items and factors are shown in Appendix III.

For each factor, a simple additive scale was developed. Mean scores for each group were then computed. A one-way analysis of variance was used to test for significant differences among groups. Since differences were statistically significant at $\alpha < .001$ level, a least significant difference *a posteriori* contrast was run to identify homogenous combinations of groups. This process resulted in three groupings of the 15 public interest groups (the landscape architects were considered a separate group in the study). The primary rationale for this process was to be able to collapse the number of individual groups displayed in analyses to ease interpretation. Table 4 shows the resulting categories of groups and mean scores on the attitude scale.

TABLE 4

MEAN SCORES FROM TIMBER AND ESTHETICS ATTITUDE PREFERENCE SCALE.

CATETORY I: PRO TIMBER HARVESTING	
Montana Loggers Association**	2.0
Society of American Foresters	2.5
Mens Eagle Club	2.5
Missoula Snowgoers	2.6
Advanced Timber Management Students	2.7
CATEGORY II: NEUTRAL	
Hellgate Motorcycle Club	2.8
Bitterroot Backcountry Horseman	2.8
League of Women Voters	2.9
Continuing Education in Fire Management Group	3.0
Hamilton Community Potluck	3.0
Helena Chapter, Audubon Society	3.0
Introductory Recreation Management Students*	—
Missoula Chapter Backcountry Horseman*	—
CATEGORY III: ENVIRONMENTAL INTERESTS	
Great Falls Chapter, Audubon Society	3.1
Missoula Chapter, Sierra Club	3.5
CATEGORY IV: LANDSCAPE ARCHITECTS (Forest Service)	
Region 1*	—
Region 4	2.6
Region 5	3.1

1 ——————————————————————————5
Pro-Logging Pro-Preservation

* Scores unavailable for these groups.

** Montana Loggers - statistically significant difference between mean scores of Society of American Foresters.

CHAPTER 4

RESULTS

General Description of Sample

Before examining the results concerning esthetic evaluations, we present a brief description of the nature of the sample.

Almost half of the respondents from the total sample were involved in professional/technical occupations (47%). Nearly 8% of the sample included students and 7% retired individuals. Craftsmen made up another 6% with the percentage of homemakers being around 8%. The rest of the occupations of the sample included in minor percentages (less than 5%), service workers, farmers, laborers, clerical workers, salesmen, managers and administrators and tranportation operatives. Five percent of the respondents did not state their occupation.

The five groups that reported 85-100% of their individuals in professional and technical fields included all of the landscape architects, the Society of American Foresters and the Continuing Education in Fire Management group. Table 5 gives a more specific breakdown of the major occupational fields of the interest groups. Since the "timber attitude" questionnaire was not developed until after sampling the Missoula Backcountry Horseman, occupational information is unavailable for this group.

TABLE 5

MAJOR OCCUPATIONAL CATEGORIES OF INTEREST GROUPS (IN PERCENT)[1,2]

Groups:	Professional and Technical	Clerical	Craftsman	Transportation Operatives	Laborers	Farmers	Retired	Housewife	Students
Sierra Club	50	—	7	—	—	—	7	7	7
Audubon (Great Falls)	31	—	8	—	39	—	23	—	23
Audubon (Helena)	50	12	—	—	—	12	21	—	—
Bitterroot Backcountry Horseman	20	—	15	—	—	10	20	15	—
Hamilton Community Potluck	12	—	—	—	—	12	—	30	16
Missoula Snowgoers	20	—	10	10	15	—	—	—	—
Mens Eagle Club	—	—	45	22	—	—	—	—	—
Hellgate Motorcycle Club	—	—	12	—	—	—	—	12	31
League of Women Voters	50	12	—	—	—	—	—	25	—
Montana Loggers Assoc.	17	9	—	—	40	—	—	—	—

1. Timber and Recreation Management classes - 100% students

2. Society of American Foresters, Continuing Ed. in Fire Mang't. Group plus all 3 Landscape Architects - 85-100% professional & technical.

All interest group members were included in the sample if they were 16 years of age or older. In most of the groups, the median age fell between 31 and 40. Eight percent of the sample included members between 16 and 21, and 20% made up those individuals between the age of 22 and 30. Over one quarter (27%) were aged 45-64 and 7% were over 65. Out of a total sample of 348, 248 were male and 100 were female.

In summary, most sample respondents included male individuals in professional/technical careers and craftsmen between the ages of 30 and 64. These social demographic variables are summarized in Table 6.

TABLE 6

Age and Sex Characteristics of Sample

Age Category	Number of Respondents	% of Sample
16-21	28	8
22-30	69	20
31-40	133	38
45-64	95	27
65+	23	7
Males	248	71
Females	100	29

Data above excludes the Missoula Chapter, Backcountry Horseman and Landscape Architects from Region 1.

Group Categories

The principle purpose of this study was to compare esthetic perceptions among the various groups sampled. As indicated earlier, specific groups have been organized into larger categories for ease of comparison. The assignment of groups to categories was based, for the most part, on the mean rating obtained from the 6-item timber esthetics scale. The reader should be cautioned that although statistical significance was used to identify categories of groups, adjacent groups in separate categories have only small differences separating them.

Category I

This category includes those groups who are primarily in favor of timber harvesting and feel that scenery should not be a major consideration in designing timber sales. They feel timber is the most important resource on National Forest lands and that some forest management activities such as thinning will usually increase the scenic beauty of a forest stand. They also tended to agree with the statement that for some recreation activities, a logged area is a better place than an unlogged area.

Category II

This category represents a wide variety of groups who for the most part are relatively neutral in their attitudes toward timber harvesting. Although 3 groups in this category, The Hellgate Motorcycle Club, The Bitterroot Backcountry Horseman and The League of Women Voters all tended to support timber harvesting more than preservation for scenic quality. Two groups whom we were unable to collect preference attitude data on included the Recreation

Management class and the Missoula Backcountry Horseman. We have included the former two groups in this category because of their relative similarity to the other groups.

Category III

Groups in this category are primarily representative of environmental interests who share an active interest in the preservation of the natural environment. These groups tended to view scenic quality as extremely important.

Scenic Beauty Estimates: General Results

As already mentioned, the SBE program compiles listings of mean SBE ratings. In order to test for differences in SBE scores among the 25 areas, it would be appropriate to use a Student-Newman Keuls (SNK) procedure. However, such a procedure leads to a complex pattern of statistically similar (and different) groupings of areas. A table with 450 cells (18 groups x 25 areas) results (APPENDIX IV). Because of difficulties in interpreting such a table, an average SBE score for each VQO was computed based on the five SBE scores within the VQO category, and then analyzed using the SNK procedure. Table 7 shows these average SBE scores and the rank ordering the score for each group. Table 8 displays the results of the SNK procedure.

The results shown in Table 7 demonstrate two patterns. First, there is a clear, nearly consistent, pattern of increasingly negative scenic evaluations as the VQO moves from Preservation through Maximum Modification. Of the 18 groups in the study, only two did not follow the pattern. Second, there is a general tendency for the scores in the Modification and Maximum Modification to become increasingly negative downward through the table

toward the environmental end of the attitude scale. The environmental groups are viewed as having a higher normative standard of scenic beauty than the timber groups.

The statistical analyses shown in Table 8 has a number of implications. First, all groups statistically differentiated areas classed as maximum modification from areas in other VQO's. Second, for fourteen of the groups, there was no statistical difference in scores for areas in Retention and Partial Retention objectives. Third, as one moves across the attitude scale toward the environmental end, there is an increasing tendency for groups to statistically differentiate among the 5 VQO's.

Comparison Among Public Group Categories

For further comparisons among the 4 groups of viewers columns of average SBE's were summated for each VQO and an analysis of variance was conducted on these mean scores to determine statistically different SBE scores among the 4 groups. Statistical significance was then further tested using Tukey's procedure. Table 9 shows the average SBE's for each interest group plus the column averages for each category. Table 10 depicts subsets of groups whose mean scores statistically differ.

What Tables 9 and 10 reveal is the extent to which there is agreement or disagreement in the scenic preferences of the 4 groups of interests among each of the 5 visual quality objective classes. Preference scores for the neutral and environmental groups are statistically similar in the first 4 VQO classes. The fifth VQO class, Maximum Modification showed statistically different preference scores for these two groups. The timber interests were also in close agreement with the later two groups in the Preservation and

TABLE 7

MEAN SCENIC BEAUTY ESTIMATES (RANKS)

	VQO CATEGORY				
	P	R	PR	M	MM
CATEGORY I: PRO-TIMBER HARVESTING					
Montana Loggers Association	-17 (1)	-23 (2)	-26 (3)	-34 (4)	-94 (5)
Society of American Foresters	7 (1)	-5 (3)	-1 (2)	-19 (4)	-85 (5)
Mens Eagle Club	-26 (1)	-62 (2)	-63 (3)	-83 (4)	-130 (5)
Missoula Snowgoers	2 (1)	-9 (4)	-4 (3)	-2 (2)	-25 (5)
Adv. Timber Manag' Students	-15 (1)	-44 (2)	-63 (3)	-110 (4)	-183 (5)
CATEGORY II: NEUTRAL					
Hellgate Motorcycle Club	-37 (1)	-77 (2)	-83 (3)	-96 (4)	-157 (5)
Bitterroot Backcountry Horseman	-13 (1)	-39 (2)	-50 (3)	-79 (4)	-124 (5)
League of Women Voters	-40 (1)	-84 (2)	-100 (3)	-135 (4)	-212 (5)
Continuing Ed. in Fire Mang't Group	7 (1)	0 (2)	-19 (3)	-52 (4)	-110 (5)
Hamilton Community Potluck	-12 (1)	-35 (2)	-59 (3)	-94 (4)	-162 (5)
Helena Chapter, Audubon Society	-10 (1)	-43 (2)	-71 (3)	-103 (4)	-165 (5)
Intro. Recreation Mang't Students	-16 (1)	-48 (2)	-71 (3)	-115 (4)	-189 (5)
Missoula Chapter Backcountry Horseman	1 (1)	-15 (2)	-53 (3)	-84 (4)	-143 (5)
CATEGORY III: ENVIRONMENTAL INTERESTS					
Great Falls Chapter, Audubon Society	-4 (1)	-30 (2)	-42 (3)	-89 (4)	-165 (5)
Missoula Chapter, Sierra Club	-18 (1)	-46 (2)	-82 (3)	-143 (4)	-205 (5)
CATEGORY IV: LANDSCAPE ARCHITECTS (Forest Service)					
Region 1	18 (1)	2 (2)	-11 (3)	-37 (4)	-87 (5)
Region 4	44 (1)	42 (2)	20 (3)	-30 (4)	-86 (5)
Region 5	21 (1)	6 (2)	-10 (3)	-52 (4)	-127 (5)

TABLE 8

Statistically Significant Differences Between Mean Scenic Beauty Estimates (Per VQO) By Each Group, at $\alpha = .05$

	VQO CATETORY					# Of
	P	R	PR	M	MM	Subsets*
CATEGORY I: PRO-TIMBER HARVESTING						
Montana Loggers Assoc.	-17	-23	-26	-34	-94	2
Society of American Foresters	7	-5	-1	-19	-85	3
Mens Eagle Club	-26	-62	-63	-83	-130	3
Missoula Snowgoers	2	-9	-2	-9	-25	2
Adv. Timber Mang't Students	-15	-44	-63	-110	-183	3
CATEGORY II: NEUTRAL						
Hellgate Motorcycle Club	-37	-77	-83	-96	-157	4
Bitterroot Backcountry Horseman	-13	-39	-50	-79	-124	4
League of Women Voters	-40	-84	-100	-135	-212	4
Continuing Ed. in Fire Mang't Group	7	0	-19	-52	-110	3
Hamilton Community Potluck	-12	-35	-59	94	-162	4
Helena Chapter, Audubon Society	-10	-43	-71	-103	-165	5
Intro. Recreation Mang't Students	-16	-48	-71	-115	-189	4
Missoula Chapter Backcountry Horseman	1	-15	-53	-84	-143	4
CATEGORY III: ENVIRONMENTAL INTERESTS						
Great Falls Chapter, Audubon Society	-4	-30	-42	-89	-165	4
Missoula Chapter, Sierra Club	-18	-46	-82	-143	-205	5
CATEGORY IV: LANDSCAPE ARCHITECTS (Forest Service)						
Region 1	18	2	-11	-37	-87	3
Region 4	44	42	20	-30	-86	3
Region 5	21	6	-10	-52	-127	3

* Homogeneous Subsets - Subsets of groups, whose highest and lowest means do not differ by more than the shortest significant range for a subset of that size.

retention classes. However, as Table 10 shows, divergences in agreement with the other categories occurred in the Partial retention, Modification and Maximum Modification VQO classes. In short, differing types of public interest groups assess visual impact of the same forest landscape in the same manner only partially. While Daniel and Boster (1976) found there was general agreement in the scenic preferences of such diverse interest groups as foresters and environmentalists, the data presented here point more towards general disagreement between timber interests and others in areas subject to substantial modification.

Landscape Architects vs. Public Interest Groups

The landscape architects' perception of the relative scenic beauty of the forest landscapes in each VQO class was in general higher than all other public groups (Table 10). Simply put, all areas depicted in the presentation were for the most part perceived as more scenically beautiful by the landscape architects. This was particularly true in Preservation, Retention, and Partial Retention VQO's. In Modification and Maximum Modification VQO's, the Landscape Architects scores were similar to the timber groups perceptions. It is quite possible that the Landscape Architects, because of their intimate involvement in application of the VMS, were using a criterion for evaluating the scenes different from the other groups. For example, they may have interpreted the views showing areas in the Preservation VQO as good application of timber harvesting sale design techniques to meet Retention or Partial Retention VQO's. Unfortunately, our data cannot test for this hypothesis.

TABLE 9

MEAN SCENIC BEAUTY ESTIMATES PER VQO CATEGORY FOR EACH PUBLIC INTEREST GROUP CATEGORY

	VQO CATEGORY				
	P	R	PR	M	MM
CATEGORY I: PRO-TIMBER HARVESTING					
Montana Loggers Assoc.	-17	-23	-26	-34	-94
Society of American Foresters	7	-5	-1	-19	-85
Mens Eagle Club	-26	-62	-63	-83	-130
Missoula Snowgoers	2	-9	-4	-2	-25
Adv. Timber Mang't Students	-15	-44	-63	-110	-183
	-10	-26	-32	-53	-105
CATEGORY II: NEUTRAL					
Hellgate Motorcycle Club	-37	-77	-83	-96	-157
Bitterroot Backcountry Horseman	-13	-39	-50	-79	-124
League of Women Voters	-40	-84	-100	-135	-212
Continuing Ed. in Fire Mang't Group	7	0	-19	-52	-110
Hamilton Community Potluck	-12	-35	-59	-94	-162
Helena Chapter, Audubon Society	-10	-43	-71	-103	-165
Intro. Recreation Mang't Students	-16	-48	-71	-115	-189
Missoula Chapter Backcountry Horseman	1	-15	-53	-84	-143
	-15	-43	-63	-95	-158
CATEGORY III: ENVIRONMENTAL INTERESTS					
Great Falls Chapter, Audubon Society	-4	-30	-42	-89	-165
Missoula Chapter, Sierra Club	-18	-46	-82	-143	-205
CATEGORY IV: LANDSCAPE ARCHITECTS (Forest Service)					
Region 1	18	2	-11	-37	-87
Region 4	44	42	20	-30	-86
Region 5	21	6	-10	-52	-127
	28	17	0	-40	-100

TABLE 10

Statistically Significant Differences Between Mean SBE's Per Visual Quality Objective Class for Each Category.

Category I - Pro-Timber Harvesting
Category II - Neutral
Category III - Environmental Interests
Category IV - Forest Service Landscape Architects

					* Number of Subsets
1.	PRESERVATION				
	Cty. II	Cty. III	Cty. I	Cty. IV	2
	-17.6	-11.1	-9.6	27.4	
2.	RETENTION				
	Cty. I	Cty. III	Cty. II	Cty. IV	2
	-28.6	-38.0	-46.3	16.6	
3.	PARTIAL RETENTION				
	Cty. II	Cty. III	Cty. I	Cty. IV	3
	-63.5	-61.7	-31.3	- 0.4	
4.	MODIFICATION				
	Cty. III	Cty. II	Cty. I	Cty. IV	2
	-115.6	-92.9	-49.5	-39.8	
5.	MAXIMUM MODIFICATION				
	Cty. III	Cty. II	Cty. I	Cty. IV	3
	-184.7	-155.0	-104.6	-99.9	

* Homogeneous Subsets: Subsets of groups, whose highest and lowest means do not differ by more than the shortest significant range for a subset of that size.

On the other hand LA scores, paraticularly in Region 1, were similar to the SAF group. This partially supports Daniel and Boster (1976) who observed that "the landscape architects perception of the relative scenic beauty of the ponderosa pine landscapes follows a pattern very similar to that of the "forester" groups.."

Timber Harvesting Attitudes and Scenic Beauty Perceptions

In past research using the scenic beauty estimation method to estimate preferences of various silviculturally treated areas, none as yet has established a relationship between individual attitudes toward timber harvesting and perceived scenic beauty. Will in fact the "pro-timber harvesting" groups perceive harvested areas as more scenically beautiful than other groups? Do the "pro-preservation" groups perceive the unharvested, pristine landscapes as more scenic than the pro-timber groups? These questions are important in helping to develop a greater understanding of how different user groups respond to different forest landscapes in relation to established VQO classes.

As already mentioned, the principle purpose of this study was to compare esthetic perceptions among various public groups. The timber and esthetics attitude scale developed in this study not only provided a tool for the creation of interest group categories but also revealed some insights into the relationships between esthetic preferences and attitudes toward timber harvesting. Looking back to Table 10 we see several interesting relationships. First, despite their pro and con attitudes toward logging, the environmental and pro-timber harvesting categories perceive the areas assigned a "preservation" and "retention" VQO class as equally scenic.

Second, as the visual quality objectives increase in modified appearance, attitudes toward logging seem to show a much stronger relationship with scenic preferences. As Table 10 shows, in the maximum modification class, the pro-timber, neutral and environmental group categories all show a differing perception of scenic beauty and even show a correct ranking.

The data shows that environmental groups did not perceive the unmodified landscapes as more scenic than the pro-timber harvesting groups. However, the data did reveal that the environmental groups perceive the more modified areas as less scenically beautiful than the pro-timber groups.

It is also interesting to note the mean scores of the landscape architects shown in Table 4. Despite having grouped them into a separate category for comparison purposes, the landscape architects from Region 4 with a score of 2.6 would have grouped in the pro-timber harvesting category. The landscape architects from Region 5 on the other hand, with a score of 3.1 are grouped in the environmental or pro-preservation category. In short, the landscape architects from Region 5 or California have attitudes toward logging more aligned with the environmental groups, and the landscape architects from Region 4 more aligned with the pro-timber groups.

A closer look at a few of the questions used on the timber esthetics attitude scale reveals the implications of this division in attitude.

- Scenery should not be a major consideration in designing timber sales.
- Thinning a forest stand will usually increase its scenic beauty.

The landscape architects in Region 4 tend to agree with these statements while the Region 5 landscape architects are somewhat neutral or slightly

tending toward disagreement. The relationship of these differing attitudes in relation to SBE's is also interesting to note. As Table 7 depicts, the more pro-timber Region 4 landscape architects rated all VQO categories as more scenically beautiful than the Region 5 landscape architects.

CHAPTER 5

SUMMARY, DISCUSSION AND MANAGEMENT IMPLICATIONS

Study Results:

The sample population made up of 15 public interest groups and 3 groups of Forest Service landscape architects generally consisted of male individuals in professional/technical careers and craftsmen between the ages of 30 and 64. These groups after rating 125 slides of various forest landscapes, each having a prescribed visual qualty objective, found as a general rule that the "preservation" slides depicting essentially unaltered landscapes were more scenically beautiful than the more modified landscapes showing evidence of timber harvesting activity.

Exceptions to this general preference pattern occurred in a few cases where despite the prescribed VQO of "modification" or "maximum modification," most all groups rated the areas much higher in scenic preference than all other areas in the same VQO category. Visual inspection of the slides of the scenically preferred areas revealed common characteristics of inconspicuous cutting units and lack of any noticeable roads, road cuts or barren ridgelines where trees had been removed. Conversely, the opposite appeared to be true of many areas in the same VQO category where glaring road cuts and barren ridgelines were common features of the landscape.

The assignment of the 15 public interest organizations to three groups was based on mean rating scores obtained from a 5 item scale that dealt with measuring attitudes and preferences toward forest management activities; primarily timber harvesting. Statistical differences between mean scores

revealed 3 categories: (1) Pro-timber harvesting, (2) Neutral and (3) Environmental interests. The landscape architects were separated into a fourth category because of their professional involvement in the VMS. The scale was developed primarily as a tool for classifying groups according to their attitudes toward timber harvesting and esthetics, but also provided some unique data on the relationships between esthetic preferences and attitudes toward logging.

In relating the three groups to relative measures of scenic beauty we found a pattern emerge that basically revealed that the greater the modification in landscape features, the less agreement in perceived scenic beauty was found among the groups. Interestingly enough, the landscape architects scenic preferences were most closely allied with the pro-timber harvesting category in the modified and highly modified areas. In most all of the areas presented, the landscape architects viewed them as more scenic than any of the other 15 groups.

The results of the rank tests on the mean scenic beauty estimation scores revealed that 16 of the 18 groups showed agreement as to the correct rank ordering of the visual quality objective classes. That is, 1 through 5. The misordering of ranks occurred in two groups from the pro-timber harvesting category. The misordering of ranks however was only found in the less distinguishable VQO categories. The results also showed that an identical rank ordering occurred with the mean SBE's as occurred with the mean raw rating scores.

An SNK procedure comparing VQO's across groups revealed that only two groups, the Helena chapter of the Audubon Society and the Sierra Club Statistically discriminated among all 5 VQO categories. Most other groups

did not distinguish between the first 3 or the second and third VQO categories. The general pattern in relation to their mean scores on the "timber attitude" scale was the lower the group scores, the least number of VQO categories were distinguished. The Montana Loggers Association who scored lowest on the scale only recognized 2 statistically differing scenic preference categories. The landscape architects recognized for the most part only 3 categories.

DISCUSSION

In summary, what the data from this study has shown is that the scenic beauty estimation method can be used to effectively measure peoples' esthetic preferences for various mid to far view forest landscapes and associate these preferences with established visual quality objective classes. The SBE method, when used in the past for "on-site" testing of scenic preferences has generally found that as the evidence of man's activity increases if kept neat and orderly), the forested areas are more liked by most of the viewing public. This study sought to develop a greater understanding of peoples' preferences in relation to established VQO's and has found a very different pattern. That is, as the VQO prescription increases in modification, forested areas are less liked by the viewing public. The difference in results could be attributed to distance of view.

Our results on individual areas being rated comparatively higher in scenic preference than similar areas with the same VQO suggests that by designing timber sales where attention is paid to road layout and the design of the cutting unit itself, scenic evaluations can be improved. This conclusion is based in part on the fact that an area in the Modification VQO

class was rated as esthetically pleasing as some of the Preservation VQO classes and an area in the Maximum Modification class was rated very similar to other areas in the Modification class. Simply put, an area with an already established VQO category of R, PR, M, MM can be improved, through appropriate design.

The findings from this study have revealed that mid to far view (1/2 to 3 miles) scenes of Northern Rocky Mountain landscapes are generally viewed as esthetically the same by differing types of public groups only if the landscapes are predominantly unmodified. More importantly, the visual management system currently in use by the Forest Service has identified 5 visual quality categories, and for the most part, the public is distinguishing about 3 or 4 scenically different visual quality categories. The most environmentally sensitive groups are able to distinguish all five. What this shows is that there is indeed justification for having 5 visual quality categories as there are members of the public that do make the distinction. The landscape architects, who are supposed to be representing the public's preferences when assigning VQO clases to the forest landscape, are only distinguishing among 3 classes. The question therefore arises: Are the forest landscapes in the Northern Rockies being assigned visual quality objectives that are products of the landscape architects perception of scenic beauty? If so, a greater effort needs to be made to include all of the public's preferences into the landscape planning process.

How are attitudes toward logging and scenic preference related? Of particular interest in this study was the new ground broken in helping to answer this question. In the predominantly unmodified VQO classes of "preservation" and "retention," all groups except the landscape architects

have similar scenic beauty preferences and yet their attitudes toward timber harvesting are not at all similar. What this suggests to landscape planners is that there is "one public" in planning for predominantly unmodified landscapes despite variations in attitudes toward logging. However, in planning for maximum modification of a landscape, the data suggest attitudes are significantly associated with esthetic preferences, suggesting a variety of publics. Landscape planners and architects need to be aware of these similarities and differences if they intend to use public preferences based information to prescribe visual quality objectives.

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APENDIX I

INSTRUCTIONS FOR PUBLIC VIEWER GROUP RATINGS

"Good evening. Thank you for vounteering for this experiment.

"Managers of National Forest lands are required by law to manage all resources of the land, including the visual resource—the landscape. To do this, the Forest Service and many other forest land managers have developed plans and procedures to protect and enhance the forest landscape.

"To aid in this program we are attempting to determine the public's preferences for different management activities, and appreciate your time in this effort.

"I'm going to show you one at a time some color slides of several forest areas and ask that you rate the degree to which you like or dislike the scene, using the scale at the top of your sheet. Note that 0 corresponds to a low rating for the scene, and 9 corresponds to a high rating.

"The first slides will be shown quickly just to give you an idea of the range of areas you will be rating. Try to imagine how you would rate these slides.

"Then, after the initial slides I will announce that you are to begin rating the next slides. You should give one rating number to each slide. Feel free to use the entire range, 0 for maximum dislike, and 9 for maximum like. Please rate every slide. I will read the slide number to help keep track and we will take a short 45 second break after slide 50. Are there any questions before we begin?"

LANDSCAPE RATING FORM

DISLIKE 0 1 2 3 4 5 6 7 8 9 LIKE

1. _____	26. _____	51. _____	76. _____	101. _____
2. _____	27. _____	52. _____	77. _____	102. _____
3. _____	28. _____	53. _____	78. _____	103. _____
4. _____	29. _____	54. _____	79. _____	104. _____
5. _____	30. _____	55. _____	80. _____	105. _____
6. _____	31. _____	56. _____	81. _____	106. _____
7. _____	32. _____	57. _____	82. _____	107. _____
8. _____	33. _____	58. _____	83. _____	108. _____
9. _____	34. _____	59. _____	84. _____	109. _____
10. _____	35. _____	60. _____	85. _____	110. _____
11. _____	36. _____	61. _____	86. _____	111. _____
12. _____	37. _____	62. _____	87. _____	112. _____
13. _____	38. _____	63. _____	88. _____	113. _____
14. _____	39. _____	64. _____	89. _____	114. _____
15. _____	40. _____	65. _____	90. _____	115. _____
16. _____	41. _____	66. _____	91. _____	116. _____
17. _____	42. _____	67. _____	92. _____	117. _____
18. _____	43. _____	68. _____	93. _____	118. _____
19. _____	44. _____	69. _____	94. _____	119. _____
20. _____	45. _____	70. _____	95. _____	120. _____
21. _____	46. _____	71. _____	96. _____	121. _____
22. _____	47. _____	72. _____	97. _____	122. _____
23. _____	48. _____	73. _____	98. _____	123. _____
24. _____	49. _____	74. _____	99. _____	124. _____
25. _____	50. _____	75. _____	100. _____	125. _____

APPENDIX III

Listed below are several statements concerning forest management activities and scenery. Please circle the letter(s) that best describe how strongly you agree or disagree with each statement.

*Scale 1 = Variable 3, 4, 6, 8, 10 and 11.
Scale 2 = Variable 5, 7 and 9.

Question #	STRONGLY AGREE (1)	AGREE (2)	NEUTRAL (3)	DISAGREE (4)	STRONGLY DISAGREE (5)	Variable
** 1. Scenery should not be a major consideration in designing timber sales.	SA	A	N	D	SD	(3)
** 2. Some forest managmnt activities can enhance the scenic beauty of an area.	SA	A	N	D	SD	(4)
** 3. Clearcuts always detract from the scenic beauty of forested lands.	SA	A	N	D	SD	5
** 4. Outside wilderness areas, timber is the most imporant resource on National Forest lands.	SA	A	N	D	SD	(6)
5. All timber sales should be designed to be compatible with scenic beauty objectives.	SA	A	N	D	SD	7
** 6. Areas which have been logged will eventually return to their original condition.	SA	A	N	D	SD	(8)
7. I never participate in recreation activities n places that have been logged.	SA	A	N	D	SD	9
** 8. Thinning a forest stand will usually increase its scenic beauty.	SA	A	N	D	SD	(10)
** 9. For some recreation activities, a logged area is a better place than an unlogged area.	SA	A	N	D	SD	(11)
10. Your age at your last birthday: _____						12
11. Sex: M F						13
12. Occupation:_____(What you do, not who you work for.)						14

* Scale used to create categories of public interest groups.
** Questions used to create scale.

APPENDIX IV

SBE SCORES BY AREA WITH AREA 1 AS BASE

VQO CATEGORY	Preservation					Retention					Partial Retention					Modification					Maximum Modification				
Area Number	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
-Groups-																									
CATEGORY I: PRO-TIMBER HARVESTING																									
Montana Loggers Assoc.	0	-5	-15	-27	-33	-12	20	-37	-39	-45	-32	-25	-23	-23	-23	-33	-60	16	-15	-77	-145	-87	-100	-50	-86
Society of Amer. For.	0	15	-4	-1	24	-16	16	18	-7	-37	-11	-3	-12	-1	21	-13	-70	53	0	-67	-117	-90	-106	-32	-80
Mens Eagle Club	0	-7	-48	-29	-45	-88	-39	-67	-39	-76	-67	-74	-84	-52	-37	-70	-149	-13	-68	-115	-151	-158	-163	-60	-117
Missoula Snowgoers	0	9	-2	-2	4	-13	26	-3	-24	-33	-17	-15	-8	-3	24	7	-34	56	2	-39	-71	-14	-65	7	-20
Adv. Timber Mang't. Students	0	0	-21	-14	-41	-56	-29	-52	-18	-65	-42	-63	-82	-89	-41	-95	-169	-31	-96	-164	-230	-177	-214	-107	-193
CATEGORY II: NEUTRAL																									
Hellgate Motorcycle Club	0	-17	-54	-46	-69	-99	-38	-84	-63	-100	-83	-99	-107	-64	-63	-82	-155	-23	-87	-137	-203	-171	-190	-81	-146
Bitterroot Backcountry Horseman	0	1	-18	-7	-44	-58	-20	-44	-29	-48	-44	-51	-85	-38	-32	-79	-136	-8	-81	-93	-132	-140	-140	-95	-122
League of Women Voters	0	-2	-46	-39	-115	-98	-69	-107	-43	-105	-74	-97	-140	-102	-86	-141	-202	-34	-128	-171	-235	-224	-241	-154	-207
Cont. Ed. Fire Mang't. Group	0	9	10	5	10	-6	22	-13	-5	2	-10	-21	-26	-29	-9	-36	-87	15	-52	-100	-151	-111	-132	-43	-116
Hamilton Community Potluck	0	6	-13	-8	-40	-32	-20	-36	-31	-52	-47	-48	-83	-70	-46	-83	-163	1	-87	-135	-188	-167	-191	-109	-158
Audubon Society (Helena)	0	9	-17	-12	-33	-61	-33	-39	-21	-60	-58	-64	-112	-75	-53	-90	-187	-4	-91	-145	-217	-181	-216	-88	-174
Intro. Recr. Mang't. Students	0	-1	-15	-17	-45	-64	-22	-51	-40	-65	-62	-87	-95	-57	-56	-99	-185	-33	-102	-159	-225	-193	-220	-121	-191
Backcountry Horseman (Missoula)	0	9	-2	6	-6	-25	0	-17	-11	-23	-40	-62	-69	-46	-47	-74	-155	-5	-77	-111	-155	-148	-171	-99	-146

APPENDIX IV (Continued)

VQO CATEGORY	Preservation					Retention					Partial Retention					Modification					Maximum Modification				
Area Number	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
-Groups-																									
CATEGORY III: ENVIRONMENTAL INTERESTS																									
Audubon Society (Great Falls)	0	14	-1	-6	-26	-58	-5	-22	-10	-55	-30	-42	-87	-37	-11	-80	-181	6	-75	-111	-186	-188	-201	-100	-151
Sierra Club	0	-5	-9	-21	-57	-51	-36	-57	-41	-45	-44	-81	-122	-96	-69	-153	-204	-46	-136	-179	-214	-195	-227	-168	-226
CATEGORY IV: LANDSCAPE ARCHITECTS																									
Region 1	0	17	14	24	36	-16	16	32	-4	-18	-2	-13	-9	-6	32	-18	-79	33	-40	-67	-126	-59	-121	-28	-104
Region 4	0	56	53	48	60	39	52	44	49	28	31	17	3	10	38	-27	-69	24	-34	-46	-105	-49	-120	-56	-103
Region 5	0	29	24	26	25	-11	14	25	10	-12	-2	-9	-27	-30	17	-49	-112	37	-55	-84	-150	-107	-157	-84	-141